Innovative Technologies, Small Groups, and a Wiki: A 21st Century Preservice Experience Founded on Collaboration[1]

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Abstract

New technology tools available at the university level have made it possible to create learning environments that capitalize on the kinds teaching practices that support augmented conversations, sophisticated communication, and collaboration; yet, existing teaching models lag in their ability to take advantage of these possibilities. Three instructors of an educational technology course for preservice teachers wanted to explore the effects of a new project, the *Innovations Mini-Teach*, that allowed students to learn about many new and evolving technologies and their application to PreK-12 education by organize themselves in ways that relied upon their collaborative abilities and a technology tool, the class Innovations Wiki. Student focus groups at the end of the semester sought to uncover the value of collaboration in students' abilities to learn new technologies, the obstacles to collaboration, and how collaborative skills may affect use of innovations in students' future teaching. Findings indicated this new approach to learning about innovative technologies was supported by small group collaboration, and that the class wiki supported whole class collaboration during the semester with the additional potential to provide students with opportunities to share after the semester ended. Most important, many students changed their views about themselves as learners of technology.

Key Words: collaboration, innovation, teacher education, instructional design, technology integration

Innovative Technologies, Small Groups, and a Wiki:
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Efforts to equalize access to educational technology tools for PreK-12 classrooms in the United States have begun to pay off (Trotter, 2007). This is good news for teacher preparation programs. But with the changing landscape of educational technology in the 21st century, instructors are more challenged than ever before because now they must: (1) accommodate the current skillset of preservice teachers, while assuring minimal technology competencies (Albee, 2003); (2) prepare preservice teachers to use the wide and changing range of technologies (Flores, Knaupp, Middleton & Staley, 2002; Hughes, 2004); (3) instill a driving desire in preservice students to stay updated with technology and (4) help them meaningfully integrate technology into their future classrooms (Williams, Foulger, Wetzel, under review). Forward-thinking programs should "foster among the students a sense of ownership for their learning…as both protagonists and authors of knowledge-building activities rather than simply as conscripted information-processors with regard to the ideas of acknowledged experts in the field" (Ball & Wells, 2006, p. 192).

Collaborative Pedagogy and Web-Based Tools

Preservice students seldom understand that as an integral part of their job, PreK-12 teachers must participate in ongoing professional development activities. Although opportunities for teachers to participate in individualized professional development are increasing, "there are sound educational advantages in group learning that mark this type of professional development as superior. Groups can become a powerful way of encouraging individuals to feats they could never manage on their own" (J. Rogers, 2001, p. 54). Small, self-directed groups have been known to provide: (1) a more supportive environment, (2) the creation of challenges unavailable in isolated learning situations, (3) the construction of more complex cognitive structures due to

the representation of a variety of experiences, and (4) a dynamic force that can lead to the creation of a community of practice as it draws its members in (A. Rogers, 2002).

Most teacher preparation entities recognize the value of professional collaboration. Instructors who help students organize themselves in ways that allow the learners to do the learning may be enabling the development of collaborative abilities relevant to future professional careers. Students who participate in these types of experiences report a sense of synergistic learning, with noticed shifts from being passive recipients of knowledge to feeling empowered, responsible learners who "reclaim a role in their own education" (Holmes, Tangney, FitzGibbon, Savage & Meehan, 2001). These positive benefits are worthy of attention at the preservice level for the attainment of course outcomes, and possibly for the benefits afforded students past their final exam.

These instructional design suggestions have coupled Vygotsky's work (1978) related to constructivism with advances in communications technology that have the ability to blur the line between the roles of learner and teacher. The resulting model, known as communal constructivism, requires instructors to "build on the knowledge, skills and energy of those at the heart of schooling—the students" (Holmes et al., 2001, p. 3). In a communal constructivism environment, students and teachers work together to develop their own understandings; with great efficiency, the knowledge students build is meant for their personal benefit, for the benefit other students, and for the benefit of their instructor (Holmes & Gardner, 2006). The addition of online collaborative technology tools available at the university level has made it possible to create learning environments like this that capitalize on the kinds teaching practices that support augmented conversations, sophisticated communication, and collaboration; yet, in many colleges of education existing curriculum lags in its ability to take advantage of these possibilities (Williams, Foulger, Wetzel, under review).

With these complexities in mind, adding innovative communications technologies to the university setting is not enough; in addition, instructors in a technology-connected environment must shift their teaching practice to support learners in ways that prompt them to "put their learning back into the community to benefit others, which will promote an evolution of learning and teaching" (Holmes & Gardner, 2006, p. 17). Activities that rely upon peer collaboration and project-based learning, apprenticeships, and publishing of information require a great deal of flexibility and unique assessment methods (Holmes et al., 2001) on the part of the instructor.

Three instructors of educational technology in a teacher education college at a large urban university in the Southwestern United States sought to add this exact dimension to their course—one that would help students learn about the many new technology tools, support each other through the exploration of innovative technologies, and would also allow them to "carry on" with learning about and implementing educational technology after the completion of the course. Instructors hoped they could begin to support these lofty goals through one innovative course project.

From Skill-Building to Innovating

Although students complete a foundational technology skills course as a prerequisite to program admission, just five years ago the preservice teacher technology course largely addressed improving technology skills. For most students this was their first extensive exposure to technology. Demographic data indicated that the basic profiles for preservice students were not changing. The undergraduate programs (approximately 1,000) still attracted first generation college students (approximately 50%), a variety of races (27% non-white), ratios for gender common in education (80% female, 20% male), and a wide range of age (62% were 19-25, 15% were 26-30, 13% were 31-40, and 9% were over 40 years old). Even though the college's demographics had been stable for the past five years, gradually instructors noticed students were

entering the course with increasingly sophisticated technology skills and were interested in learning more about integration strategies.

A recent change in the course content, and the focus of this study, occurred with the adoption of the *Innovations Mini-Teach* project. This new project was brought about by the surge of new Web-based tools, the increase in access to computer technology, and an increase in peripheral devices (e.g., SmartBoards, digital cameras) in local PreK-12 classrooms. The educational technology instructors now felt that within the time limitations of a single course it would no longer be possible to do justice to the myriad of technology integration tools and techniques. Due to these circumstances, instructors felt it might be helpful to explore ways of preparing students to become the kind of teachers who are capable of learning new technologies and devising uses to enhance specific teaching and learning needs. Instructors founded this new assignment on their understanding of the capabilities of collaboration and the assumption that preservice teachers could rely on each other to research and freely explore new technology, become expert users, and devise valuable ways to allow technology to enhance student learning. Instructors felt the topics and instructional design of the *Innovations Mini-Teach* project exemplified the type of learning processes represented in the National Education Technology Standards for Students (NETS-S): creativity and innovation; communication and collaboration; research and information fluency; critical thinking, problem solving, and decision making; and digital citizenship; and technology operations and concepts (International Society for Technology in Education, 2007).

The course-specific goal of the *Innovations Mini-Teach* project was to acquaint students with new and evolving technologies in an atmosphere where they could help each other to learn their assigned technology. Success would be dependent upon the many facets of collaboration by small groups (2-4 students) who worked toward the following group outcomes:

- learn one innovative technology and its possible classroom application(s) outside of class time and mostly independent of the instructor
- work together, taking advantage of each others strengths
- design and deliver instruction (of their innovative technology)

Additionally, groups would support others in the class through the following outcomes:

- make available usable resources for future class assignments and possible use as a teacher
- learn from peers about many innovative technologies and their possible classroom applications through a 15-30 minute modeling or hands-on experience provided for classmates during an assigned class session
- provide resources that could be used after the end of the course (through a class wiki)

Instructors anticipate innovations topics will change each semester to accommodate the skillset and teaching needs of any given student group as well as any new developments in technology tools. During the semester of this study, students of the three instructors investigated over twenty-five different innovation topics including wikis, blogs, Smartboards, podcasting, Google Earth, and Social Bookmarking.

Methods

Instructor researchers sought to investigate the process, perceptions, and outcomes of students who learned *with* and *for* peers (Holmes et al., 2001) after their experience with the *Innovations Mini-Teach* project. This study was to provide an avenue to make calculated modifications to the project so instructors could be more certain to support the intended long-term goal—that students who were connected with their peers as they learned about innovations would value the ability of collaborative professional development experiences to support ongoing refinement of their future teaching (Foulger, 2005). Specifically, three research questions central to the elements of collaboration were investigated:

1. What value did collaboration add to the ability of students to learn new technology?
2. What obstacles inhibited students' collaboration abilities?
3. What are students' perceptions about how collaborative skills may affect use of innovations in their future teaching?

Data Sources and Analysis

Focus groups (Krueger, 1998) were used to gather a deep understanding of the range of student perceptions at the end of the project. It was hoped that the depth provided by student conversations would support the fine-tuning of instruction, and provide qualitative substance related to the role collaboration played. To assure focus group subjects represented the range of viewpoints, all captive students in six of the sections of the required educational technology course (n=126) as taught by three separate instructors were questioned about whether they felt "this assignment should remain in the syllabus for next year." This screening questionnaire also ascertained students' availability to attend one of the scheduled focus group sessions. As to whether or not the project should remain in the syllabus, 30% of the students strongly agreed, 45% agreed, 15% disagreed, and 5% strongly disagreed. Seventy-five percent of the students surveyed were available and agreed to be in the pool of students for a focus group session, which was to take place outside of class time.

To assure unbiased, random selection of focus group participants, the screening questionnaires of students whose schedules allowed them to attend a focus group were given to a faculty member not associated with the study. This outside faculty member was directed to use a purposeful sampling technique known as maximum variation sampling (Patton, 2001) to create the student groups. This sampling technique provided researchers with a wide range of variation in students' perceptions of the project within each focus group. The resulting four focus groups were comprised of students equally representing each of the six courses with a maximum range

of perceptions about the project. Due to the fact that very few students strongly disagreed or disagreed with the usefulness of the assignment, the percentage of students who were adverse about the project were small; but this ratio represented the reality within the larger student population. Each focus group had 4-8 students (total of 24 students) and was led by a faculty member familiar with the assignment, but not the students' instructor of record. Two focus groups were comprised of primarily elementary education, one of secondary education, and one of early childhood majors. This subset of students represented the larger demographic of the teacher certification programs in the college as described earlier.

The four focus group sessions were conducted based on methods described by Krueger (1998). Digital audio files of focus group discussions each lasting approximately 60 minutes were recorded and converted to text. As recommended by Krueger (1998), the group leaders posed an initial question to allow each participant to become acquainted with the topic, recollect their thoughts, and listen to their colleagues. Participants were asked to introduce themselves to the others and to explain their *Innovations Mini-Teach* experience. This was followed by a set of questions that each preservice teacher addressed. Example questions included: a) What were the major steps to complete your presentation? b) Did you or your fellow students have problems in putting together the project? What were the problems? Has this changed over time? c) How did you learn to use the innovation? d) What are the disadvantages or concerns resulting from putting together your presentation? e) Did you face any obstacles in preparing your project and presentation? f) As you look back on the experience, has it been worth your investment of time and effort? g) Do you plan to use the wiki after you graduate? Add to it? Use lessons from it? Use it with your students? Additional follow-up questions occurred naturally to clarify answers and build on the responses.

After the focus group audio files were transcribed, instructor researchers analyzed student responses using qualitative analysis software, HyperRESEARCH Qualitative Analysis Tool v. 2.8 (Researchware, 2007). They began this process by reading and rereading transcriptions of the focus groups. Guided by the research questions the three faculty researchers achieved high levels of reliability of the coding scheme by working side-by-side to collaboratively code one of the transcribed focus group discussions. Codes were continually revised then categorized to help researchers identify emergent themes. During that process a common set of categories and associated codes was established. Next, each researcher individually coded the remaining transcribed focus group sessions. To maximize inter-rater reliability of the entire dataset, meetings were held in which researchers came to agreement on how each individual unit of thought for all transcribed focus group sessions would be coded. As the analysis progressed, researchers continued to revise the coding system as needed to reflect the various sources of evidence related to students' experiences. Of the final 28 codes, there were 12 codes directly related to collaboration that fell in the following categories: collaboration effectiveness, learning strategies, long-term effects, and advice.

Results were constructed with primary consideration given to focus group data. The class wikis, group presentations, and the end-of-course effectiveness survey data were used to triangulate student focus group data and confirm the trustworthiness (Lincoln & Guba, 1985) of the results. Instructors are in agreement that the results reported herein hold true for the general student population.

Results and Discussion

What Value Did Collaboration Add to the Ability of Students to Learn New Technology?

Since the instructors assigned students to groups and topics, the process of creating presentations with unfamiliar peers mandated that group members quickly coalesce, coordinate

efforts to research and learn the innovation, and prepare the final presentation. Students in successful groups realized the need to exercise certain skills that were not normally necessary for individualized work. Groups used a combination of meetings and email to complete the project.

Proactively, instructors attempted to take measures that would support group success (e.g. planning contracts). But, given that the majority of group processing needed to take place outside of class meetings, they also communicated willingness to support individual groups as needs arose. Students reported that the small groups (2-4 students) allowed group autonomy to "define the terms as far as when and how" they would interact to achieve their desired outcomes. Students reported they recognized the benefits in quickly "…getting to know each other." A major theme emerged that collaboration provided much support to students.

Students noted that some element of leadership appeared to be necessary for them to successfully delegate responsibilities, establish a timeline, attempt to equalize the workload, and in general commit to a process that would lead to a final presentation meeting their standards. This student noticed how a calendar with process checks positively affected group commitment:

> We used a time-line to schedule -- "ok you do research on this part and the other members work on the other part" so it was easy - everything was in a time-line. Every day it was like scheduled.

Instructors used a technology questionnaire to help distribute students who were technology experts among groups (all teaching materials are freely shared at http://www.west.asu.edu/tfoulger/innovations/Home.html). Because of this, group membership represented a range of general exposure to technology. About half of the groups had members who were "Pretty Good" or "A Pro" with the assigned innovation. Almost all students felt that having an expert in their group supported their ability to learn about the innovation. One student

noticed her technology inefficiencies, but quickly realized that the varying skillsets within her group made it possible for her to be successful:

> … they paired you up with someone that maybe knew a little more - or if you knew more then you'd be paired up with someone who knew a little less. I thought it was a neat way to do it because I learned a lot about handhelds…from the girl I was working with.

Another group also assigned to handhelds operated in a different manner. This group did not have a member who was a noted expert; but its members used available resources to tackle learning the new technology:

> … we were able to go downstairs in the Educational Library, and we [borrowed] a whole box of the hand-held PDAs and so everyone got one and then we'd walk through little steps of what you can do….we didn't really use 'Google' or anything, ours was just kind of like, "ok well I know how to use a calculator" and she knew how to use a PDA, so we just kinda like collaborated on it and just used each other, so it was pretty easy - I was surprised.

A majority of students agreed that they felt comfortable helping each other through learning their assigned technology. Even cross-group collaboration was initiated by students and occurred informally outside of class. Similarly, both instructors and students noted this affect during in-class presentations:

> We knew what we were doing fairly well, but as far as like feeling like unprepared, it wasn't even a factor because everyone in the classroom was so willing and you know there to help you through it, if they knew something about it. Then they'll … raise their hand and they'll share it with you so it's kind of, as far as being prepared, I think just having something that we fooled around with, … made it a lot easier to know what you were doing while you were up there. … we felt fairly prepared for our presentation.

The evidence suggests that preservice teachers valued the collaboration element of the *Innovations Mini-Teach* project. Instructors provided "supported freedom" that gave students the opportunity to practice their collaborative skills in a mandated, yet scaffolded and safe manner. In fact, eighty percent of the students participating in focus groups enjoyed the collaboration, appreciated the benefits it offered, and felt that working with a partner allowed for maximum success because they could wholeheartedly "try to help as much as they could" without feeling like they needed to know everything. All students understood that in some way collaboration enhanced their learning opportunities through the abundance of hands-on exploration and research with their group members, direct learning and other in-class experiences provided by other groups, and ongoing access to the class wiki where collaboration could occur even after the semester's end.

What Obstacles Inhibited Students' Collaboration Abilities?

Although a majority of students were successful in the collaborative efforts, the instructors expected difficulties with group dynamics, and provided proactive measures meant to support productive group processes to the extent they could, including detailed project materials, clear expectations, the willingness to coach individuals or full groups when needed, and by presenting the first innovation to the class as a model. Yet, some students in the focus groups shared problems they encountered related to inter-group dynamics stemming from communication problems. Ten percent of the focus group students reported problems significant enough that their work was hindered or they were forced to work by themselves (e.g., partner dropped the course, major problems at home). Another ten percent had lesser problems that were handled by the students themselves such as when group members did not follow through on commitments, were not approachable, or did not consistently communicate via email. For example, frustrations arose when schedules didn't permit for convenient meetings outside of

class. Although these types of issues were viewed as unavoidable and “kind of an annoyance,” they were typically worked out independent of the instructor. When communication broke down over ongoing issues, as it did for two of the students in the focus groups, group effectiveness was inhibited, but the project was still completed.

Issues external to the group such as employment responsibilities or other personal pressures and expectations caused some students to commit less time to the process of preparing for their group presentation. Students in groups with members who had limited or inconsistent involvement in the process tended to make attempts to “reach out,” but reported personal frustration over their inability to make progress toward the project’s goals. Out of the numerous mini-teach group presentations, two interpersonal situations required instructor intervention. One student talked about being frustrated to the point that she claimed she “didn’t know what to do” and ended up preparing for her group’s presentation by herself. In the end, she remembered how she gave her partner many opportunities before she “took over the project [because she was] nervous that it wouldn’t get done.” Although this student felt collaboration actually hindered her, in the end she also recognized her depth of understanding of the innovation, and knew her instructor “realized through the presentation that my partner didn't really know what she was talking about….and it ended up showing in our grades.”

Group stability ended up not being an overwhelming issue for one student whose group member withdrew from the class. The stranded student lacked the confidence to carry on alone and was brought into a new group in the middle of their process. While the new addition impacted the original collaborative working structure, the pre-existing pair adjusted to accommodate the new member:

We had a third person come in kind of at the last moment, but it worked out pretty well—

We decided right away how to divide: one person was gonna – I checked out the PDA

> and kind of played with it, as well as somebody else, so then the third person looked up information on the Internet and started on our presentation. I think we collaborated pretty well.

Although collaboration was poised as an important factor to student success for the *Innovations Mini-Teach* project, evidence suggests that to varying degrees struggles existed for nearly all the groups. However, change theorists who agree the adoption of new practices is greatly supported by collaboration (Bennis & Biederman, 1997; Fullan, 1994; Hall & Hord, 2006) note similar problems—that the social side of innovating can be tricky.

During the *Innovations Mini-Teach* project faculty viewed struggles as situations that provided learning opportunities for students to develop their interpersonal skills—the same skills faculty felt could support students' professional development processes once they become teachers. By interjecting only when absolutely necessary, and in ways that did not promote a dependency on instructors, instructors were able to help students capitalize on struggles, "make problems their friends", and expand their interpersonal skills in preparation for future involvement in such professional development processes reliant upon collaboration.

What are Students' Perceptions About How Collaborative Skills May Affect Use of Innovations in their Future Teaching?

As students experienced different innovative technologies and listened to their peers illustrate the possible classroom uses, they began to reflect on whether or how they would use the innovations in their future classrooms. For example:

> We covered [our assigned innovation] thoroughly - I think we covered every aspect of it…. I definitely see the value of the projects and definitely see how I would need to know these things as I go into my own classroom, but I don't believe that I entirely came

> away with a full, comprehensive understanding from some of the projects—from some of the presentations.

Even by the end of the semester one student furthered her understanding of innovations assigned to other groups; now she sees the wiki as a place for ongoing sharing among peers:

> I've actually already been back in there and have been looking through stuff; using stuff for [another assignment]. I went back to the SmartBoard [section] and pulled up some of the lessons that they used to have the kids play around with, so I've already done that. So yeah, I think I will be continually accessing and definitely if I find something that's worth while, I'll put it up there 'cuz any help I can get is great. So I figure everybody else will feel the same way.

The class wiki will be available to students as they enter their profession. This being the case, students can use the wiki for future coursework, internship purposes, or future teaching endeavors. When specifically asked if they would use the class wiki in the future, most students hadn't thought of a "never-ending course" before, and didn't realize future access to the wiki was possible; but, when presented with the idea, all forum participants unanimously reported it would be beneficial and that they probably would use it.

> Most of our presenters included like a tutorial, how to use it, and different elements of how to put something, like how to put a Podcast together, how to make an iMovie, or those kind of things - so it might not have been something I grasped right at the time, but if I want to use that innovation, I can go back there and learn it step by step... a real quick overview.

Two students specifically noted that the innovations presented by peers had already proven useful for the *Vision Video* project (through support available via the wiki about video editing and as a catalyst for ideas of tools and integration strategies) In general, students realized the

personal relevancy of “what I will use, and what maybe I won't use as much, but I know the knowledge is there if I do need it.”

Although student responses to this question differed widely, generally, students expressed meaningful ways they planned to use the innovations in their future teaching. Educational change experts (Senge et al., 2000) claim that team learning is a component of an innovative learning system that mandates the development of quality relationships where people learn to work together to learn new ways of teaching. Preparing preservice teachers with skillsets that are needed for this kind of learning is a complicated task; but evidence suggests this project does indeed support students’ beliefs about their plans to use innovations in their future teaching. This is likely because this learning environment mirrors the types of environments where a high value is placed on reflective dialogues and the development of the type of social norms where learning and inquiry permeate everything (Darling-Hammond, 1998; Fullan, 1994). Adopting technology innovations is developmental and ranges from the learning of basic operations to taking on leadership experiences (Hall, 2005). Instructors of the *Innovations Mini-Teach* project are intentionally preparing students to join school cultures as collaborative teachers, empowered problem solvers, and change agents (Darling-Hammond, Bullmaster & Cobb, 1995).

Implications and Conclusions

Teacher educators have a lot to offer their students as they serve multiple roles including instructor, mentor, facilitator and model. But, in this study researchers turned the tables to ask, “What do preservice teachers have to offer one another, and eventually, to offer their field?” The *Innovations Mini-Teach* project allowed instructors to capitalize on the power students can provide one another as they explore the collaboration with one another. The unique instructional form of this project was founded on communal constructivism (Holmes et al., 2001) and allowed for both depth and breadth of coverage (Collins, 1996), but in a manner that did not tax the

students. The instructors concluded that students gained high levels of expertise with their assigned innovation *and* became familiar with the range of innovations covered by their classmates and archived in the class wiki. The embedded technology (the class wiki) produced a situation in which the knowledge gained by one group was also owned by others in the class. As well, the wiki provided students with long-term access to the menu of innovations—a learning idea that was foreign to students before this project. Most importantly, students relied on collaboration--and for many of them this changed how they viewed themselves as learners of technology.

This study encompassed one semester, and consequently did not provide researchers with data about the students' abilities to collaborate or use the innovations in their future classrooms as practicing teachers, or to understand the wiki's use beyond the end of the semester. Likewise, even though students were successful with learning their assigned innovations during the semester, the adoption of long-term innovative behaviors by the students is not known. Further research designed to understand these long-term effects of the collaborative exploration and innovation with technology would add to the field of research. Additionally, further exploration of how to engage learners in the experiences described in this study would be helpful in the design of professional development experiences.

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